ELECTRONIC TRANSACTION SYSTEM USING A PORTABLE PERSONAL DEVICE

This invention relates to an electronic transaction system using personal portable transaction devices that can be used for loading data and communication of information generated from these data to a user.

At the present time there are various electronic transaction systems designed to manage payment of purchases of equipment goods or services, or to control authorization for access to different services. Typically, these systems are based on electronic cards and particularly smart cards assigned personally to users of electronic transactions. The card holder then makes transactions either by inserting the card in a reader terminal in the electronic transaction network, or by placing the card close to a toll terminal or a remote access terminal designed for this purpose.

In the first case, the terminal comprises electrical connectors that set up a resistive contact with corresponding contact pins in a micro-circuit on the card, in order to enable data exchanges related to the transaction.

In the second case, the card comprises an antenna or an induction loop connected to the chip to make the link with the terminal. Transaction systems operating on this principle of remote data exchanges are often known as "contact free passes". One example is a remote toll card for passing through motorway toll booths without stopping.

Regardless of what means is used to make the electronic transactions (with or without contact), the card or similar equipment cannot communicate useful information to the holder except for a brief message specific to the transaction being done. For example, a conventional remote toll card comprises a light emitting diode and/or a beeper to indicate whether or not the toll operation took place correctly. This type of message is qualified in this description as a "non-random message". This term denotes any message type that is pre-ordered according to the use of internal functions in the transaction device or transactions already carried out or being carried out. In other words, the contents of these non-random messages may be predicted by prior knowledge of predetermined operating protocols and possibly the history of the use of the personal transaction device. For example, "non-random" messages in particular comprise all commands and signals (for example acknowledgement signals) exchanged between the fixed protocol for transactions, and updated data originating from these transactions in a predictable manner. These transactions may consist of information about a remaining balance, statistics based on use of the device and any other information provided locally in the portable device such as the time, date,

standard welcome messages, pre-programmed usage guides, etc.

Another objective of the invention is an electronic transaction system based on the use of a personal portable electronic transaction device, for example a smart card or similar, enabling a user to receive various types of information through the card.

Consequently, the invention proposes an electronic transaction system between an installed network and personal portable transaction devices used to make electronic transactions through the installed network, characterised in that it also comprises means of loading random information from the network into personal portable electronic transaction devices such that this random information can be read from personal portable electronic transaction devices.

For the purposes of the invention, "random information" generally comprises any type of information that is not in the category of non-random information mentioned above. Therefore, random information is not predictable from internal operating rules of the transaction network or internal programs in the portable personal device. In particular, it may be specific information or messages of various types originating from outside the existing transaction system and added to it in order to have it resent to personal transaction devices that use the system.

For example, random information may consist of complementary information messages or messages related to a service or an object obtained by the transaction. Thus, in an application in which the transaction system is used for the access right to a transport network, the random information may be composed of messages

about the operating state of the network, information about directions or transfers to be used, promotion messages, information about services offered, etc. There is not necessarily any thematic relation between the random information and the transactions, that may consist of general advertising messages, news, games, etc.

Advantageously, random information can be loaded to personal portable electronic transaction devices starting from at least one terminal used to perform transactions with these personal devices. In this way, random information can be loaded during a transaction.

Preferably, random information is loaded by a "contact free" exchange between the terminal and the personal portable electronic transaction device. In this case, the transaction and the random information transfer may be done using a "contact free" exchange. However, the invention can also be used for transaction terminal with contacts, for example conventional electronic card readers.

A preferred embodiment of the invention includes voice reading means for random and/or non-random information collected or generated by the personal electronic transaction device, these means comprising conversion means integrated in the personal transaction device.

The voice reading means for information collected or generated by the personal electronic transaction device form a man-machine interface that is particularly attractive for electronic transactions. It makes it possible for the blind or almost blind to use electronic transaction devices, whereas

conventional payment or electronic control systems are particularly difficult for these persons.

The voice function is also advantageous for persons who are normally obliged to put their spectacles on or take them off to see information on a screen, or even for anyone who needs information (random or not random) in badly lit locations. Furthermore, it can be used to divulge information to persons with reading problems.

The voice reading means mentioned above are used to convert a flow of digital signals from any source such as a memory or real time transmission into an audio signal that is perceived by the person receiving the random message as being a message spoken through a loudspeaker or an earpiece.

In order to make the best use of the limited memory capacity of the personal electronic transaction device, at least some of the information that will be presented in voice form is compressed, for example using data compression according to the MPEG 3 standard, and the voice reading means is provided with data decompression means.

This arrangement is also a means of shortening the transmission time and therefore reducing the necessary transmission range for the same quantity of information transmitted in non-compressed form.

In one preferred embodiment, the data compression only applies to the random information.

In this case, the reading means may also comprise voice synthesis means intended to present non-random information generated within the device or received from a terminal. Obviously, the information (random and/or non-random) may also be presented visually, for

example by means of a display screen with a scrolling display on the personal device or its separate welcome device.

The random information may be input and routed in various ways depending on the shape of the device.

In one embodiment, the device comprises two separable parts composed of a card (such as a smart card) capable of doing electronic transactions independently and a device into which the card fits for reading random and/or non-random information.

Preferably, the card contains the means for reception of information read by the device into which the card fits, from the network, for example these means being an antenna and a demodulator.

In another embodiment, the personal transaction device is made in a single piece. In this configuration, it may advantageously be integrated in a device with a primary function unrelated to electronic transactions, for example a mobile telephony terminal.

When the personal transaction device according to the invention is functionally integrated in a mobile telephony terminal, at least one of the following means in the telephony terminal (provided that they are available) is adapted so that it also enables embodiment of the personal transaction device:

- the reception and/or transmission interface by radio waves;
- data storage means;
- calculation means;
- audio output means;
- manual command or data input means;
- voice synthesis means;
- the integrated smart card; and

- the electricity power supply.

Other advantages and characteristics of the invention will be clearer after reading the following description of embodiments given solely as examples with reference to the attached drawings in which:

- figure 1 is a simplified diagram showing an example of random information transmission relay according to the invention, implemented in an automatic barrier;

- figure 2 is a simplified block diagram of a personal electronic transaction device according to a first embodiment of the invention;

- figure 3 is a perspective view of the personal electronic transaction device according to a first embodiment of the invention; and

- figure 4 is a simplified block diagram of a personal electronic transaction device according to a second embodiment of the invention.

The example embodiments of this invention will be described in the context of a public transport network such as a metro that uses a personal portable electronic transaction device that is used as a means of payment for public transport and as a transport ticket when passing through control barriers. This same device may also be used as an electronic wallet in different shops. In this part of the description, it will be assumed that the personal transaction device is a smart card (denoted "card" in the following), identified as reference 2 in figure 1. The card 2 may be used in association with a device in which it can be fitted, for example a card case comprising elements capable of reading and/or management of data and that will be described later.

Thus, figure 1 shows a control barrier 4 in the form of a turnstile. The barrier 4 comprises electronic equipment (not shown) designed for two separate functions:

i) authorization to pass when a valid card 2 is presented in its checking area, and

ii) transmission of random messages to the card.

The first function is known in itself, and is used for example in motorway toll booths as mentioned above. In the example, the control is made without contact, in other words the validity state of card 2 is verified by a two-directional remote data exchange through a radio wave or infrared link starting from a connection interface 6.

The technical means necessary for this first function are well known to the expert in the subject and therefore will not be described further in this document for reasons of conciseness.

The second function is combined with the first function such that the card 2 can be downloaded through the same connection interface 6 with random information so that this information can be made available to its holder either in real time or afterwards. Thus, the barrier control and downloading of random data may be done together as card 2 is passed.

In accordance with the definition given in the introduction, in this case the random information may include all information external to management of the transaction (in this case the conditional crossing of the barrier 4), for example information concerning directions and transfers to be taken, for example determined based on a destination station read from the card, the traffic state (signalling of occasional

technical problems, the time before the next train, the station at which it is recommended that passengers should get off for a special event or if a station is closed, promotions, advertising messages, etc.).

It will be noted that random information can be loaded intelligently, namely starting from data contained in the personal device or the programming of this device.

The random information is initially received through the connection interface 6 starting from an information centre 8 through a radio link (or wire link) at a transmission frequency F1 that is not the same as the frequency F2 used for exchanging data with the card 2. The connection with the centre 8 may be set up by relays and/or by cables. As a variant, the random information may be loaded by inserting memory modules in the control barrier equipment 4.

Figure 2 is a simplified block diagram of a personal electronic transaction device made from a smart card 2 and a device into which it fits in the form of a card case 10 in this case.

The various functional elements are shared between the card 2 and the case 10.

In the example, the card 2 comprises a microcircuit in the form of a chip 12 provided with a set of contact pins 14 enabling input and output of data and power supply voltages to and from chip 12 and case 10, or a transaction terminal with contacts. In this way, the card 2 can operate independently with a payment terminal or a terminal providing a conventional service. It may be a multi-function card that can also be used as an electronic wallet, a point's card, identification card, etc., in different electronic

transaction networks. The chip 12 also contains a memory area for the temporary storage of data before their transfer.

Card 2 also comprises contact free data exchange means based on a radio antenna 16 functionally connected to chip 12. In particular, this antenna 16 receives random data transmitted in modulated form, for example from the connection interface 6 (figure 1). Consequently, the microcircuit 12 comprises a demodulator with an input connected to the antenna 16 and an output supplying binary data extracted from the modulated signal. The techniques for modulation (at the connection interface 6) and demodulation (at the micro-circuit 12) enable bi-directional communication of digital data and are known in themselves, and will not be described here for reasons of conciseness.

The case 10 comprises a housing 18 in which the card 2 and a contactor assembly 20 fitted with contact pins 22 can be inserted. These contact pins are laid out so that they are electronically connected to the corresponding pins 14 of the card 2 when the card is inserted.

A battery 24, that may be but is not necessarily rechargeable, is contained in the case 10 to power the entire set of functional elements, including the chip 12 of the card when the card is housed in the case.

For more clarity, all functional elements of the box 10 that makes up the case (and that will be described later) are shown diagrammatically outside this box.

The assembly is centred around a microprocessor 26 designed to execute a program stored in a memory 28, in this case made in the form of a read only memory (ROM).

Thus, the microprocessor is capable of managing transactions (acknowledgement of orders, purchasing, reservations, total number of loyalty points, etc.), with a terminal.

The microprocessor 26 also exchanges occasional data with a random access memory (RAM) 30. These data comprise the state of the accounts and the history of accounts managed for the different services, and is also used for storage of data about random and non-random information.

Random and non-random information is sent to the user of the case 10 in voice form, through an audio decompression unit 32 and a voice synthesis unit 34 respectively. These units 32, 34 are controlled by the microprocessor 26 to format data from the RAM so that it can be represented in useable form by an audio module 36. The audio module 36 comprises one digital-analogue conversion stage and an amplification stage, the amplification stage being adjustable in volume by a potentiometer 38 accessible by the user.

The audio module 36 controls outputs for a mini-loudspeaker 40 and an earpiece connector 42.

The case 10 also comprises a display device 44 connected to the microprocessor 26 to present random and/or non-random information.

The various functions offered by the device may be controlled using a manual control unit, in this case in the form of a keypad 46 associated with a logical interface. These functions include particularly on/off commands, input of data related to a transaction (digital data) and reading random and/or non-random information.

We will now describe an example of operation of the card 2 and case 10 assembly. The configuration of the assembly enables the use of the card 2 alone (in other words outside its case 10), as a conventional smart card. In this case, the card alone can be connected to a contact terminal to make various purchase, credit charging, accounting and updating transactions, etc.

In this example, card 2 may also be used alone to perform all types of transactions related to its use as payment mode, for accounting and as a transport ticket with respect to the transport network.

When the card 2 is placed in its case 10, the personal transaction device formed by the combination of card 2 and case 10 also enable loading and restitution of random information.

The random information routing sequence system will now be described. Initially, the information is generated at the information centre 8, and is then distributed through the radio (or wire) link at frequency F1 to control barriers 4 and other terminals of the information system to be stored in it. When a personal transaction device 2, 10 is presented in the active area of the barrier 4, the connection interface 6 transmits all or a selected part of this random information to antenna 16 of card 2 on a signal modulated at frequency F2. This transmission may be done before, after or in time-sharing with respect to the non-random data exchange related to the transaction (which in this case is the counted authorization to pass). The range of the transmission at frequency F2 from the connection interface 6 is sufficient such that the personal transaction device 2, 10 can continue to

receive information for a few minutes after passing, so that relatively long files can be loaded correctly. The modulated signal received by the antenna 16 during the transmission is processed by the demodulator in microcircuit 12 to extract digital data about random information thus loaded.

In the example, the above-mentioned digital data are firstly compressed before they are transmitted through the connection interface 6. Compression is then done using the standard protocol known as "MP3" or an equivalent protocol. This standard is particularly suitable for transmission of digital sound files (music and voice).

The compressed digital data thus received can be temporarily stored in a buffer memory area in microcircuit 12 in card 2 before being transferred to the different elements of case 10. They can also be transmitted directly towards elements of the case 10.

In both cases, the compressed data are transmitted from card 2 to case 10 through contacts 12 and 24 to be loaded into memory 30 under the control of microprocessor 26.

Random information is read either automatically, or under the control of the user transmitted by a button on the manual controls unit 46. In the latter case, the microprocessor 26 may be designed to transmit a sound signal indicating that information is loaded on the loudspeaker 40 or on the earpiece 42. This signal may be a pre-programmed spoken message produced using the voice synthesis unit 34 or a particular dial tone.

When random information has been read, the corresponding data are unloaded from RAM 30 and transmitted to the decompression unit using the MP3

standard. Decompression at this unit may be done by a program executed at least partially by microprocessor 26.

Decompressed data are transmitted in the form of a flow of binary signals to the audio module 36, where they are transformed into a voice message.

At the same time, the microprocessor 26 can control presentation on the display device 44 of the same message or complementary information, that can also be extracted from data received from card 2.

When the personal electronic transaction device emits non-random information in the form of a voice message, for example an acknowledgement indication, an indication of the amount of the available credit or internally managed data such as the date and time, etc., the voice synthesis unit 34 processes data about this information. In this case, the data in question that may originate from the ROM 28, the RAM 30 or the card 2, are transmitted to the voice synthesis unit 34 under the control of the microprocessor 26. In this case, the data are specifically formatted to reproduce their contents in voice form using techniques known in digital recording. Data output from the voice synthesis unit 34 are put into the same format as data output from the decompression unit 32, in the protocol used for building up binary words. Consequently, these data are perceived transparently by the audio module 36 that transmits them in audible form to the loudspeaker 40 or the earpiece 42.

Figure 3 is a perspective view of the personal transaction device consisting of the card 2 and its case 10. The case 10 is provided with a mini loudspeaker 40, manual controls in the form of a

numeric keypad 46 and a display 44, on the same face. The volume adjustment potentiometer 38 and the earpiece connector 42 are located on one side of the case 10.

There is a slit 48 on one edge 10a of the case into which the card 2 fits such that the contacts 14 and 22 of the card and the connector 20 of the case are engaged in it when the card is entirely or partly placed in the case.

As a variant, the personal transaction device can be made as a single piece. In this case, a box resembling the case 10 also permanently contains the functional elements of the card 2, and particularly its antenna 16. The microcircuit 12 forming the chip of the card may then be functionally integrated in the microprocessor 26.

Figure 4 shows a second embodiment of the invention in the form of a simplified block diagram, in which the personal transaction device is included in a mobile telephony terminal (handset).

In this figure, elements with functions identical to or corresponding to those in figure 2 or 3 have the same references and will not be described again, for reasons of conciseness.

It will be noted that a mobile telephony terminal conventionally comprises a keypad, a display, a microprocessor, a RAM and ROM, means of sending and receiving information by radio, and an audio output on an earpiece. This type of terminal also comprises a smart card programmed as a function of services allocated to the subscriber of the telephone network and personalised by an access code. All these elements may be adapted to functions like those described for a personal electronic transaction device also enabling

the reception and broadcasting of random sound information.

Thus, in the scheme shown in figure 4, existing elements of the mobile terminal are used identified in the form of blocks similar to those in figure 2, so that they can also perform functions related to transactions with the possibility of processing random information, namely:

- the microprocessor 26, ROM 28 and RAM 30 assembly programmed to operate telephony and the interface with the user is configured so that it can also perform the functions described with reference to figure 2;

- the manual controls 46 that are accessible through the telephone keypad, these controls being operated by a specific button or by inputting a code;

- the display 44, which may selectively display information related to telephony, transactions or random information;

- the audio module 36 with volume control 38 that transmits the audio channel of the telephony system or voice synthesis units 34 or data decompression units 32 to the earpiece or to the loudspeaker 42 selectively, to transmit random and non-random information respectively;

- the smart card 2 included into the terminal, that also comprises the modules necessary for operation of the personal transaction device, either by integrating them on the same chip, or by providing several chips respectively with appropriate reading means;

- the radio interface 60, comprising reception means for radio telephone communication starting from

an antenna 62 and demodulation means, that may be adapted to integrate functions of the demodulator integrated in chip 12; and

- the battery 24 that powers elements necessary for telephony and elements necessary for use of the personal electronic transaction device.

The personal electronic transaction device in the form of a mobile telephony handset adapted as shown in figure 4 is used in approximately the same way as the device in figure 2. However, for practical reasons, all transactions will be made using contact free exchanges with antenna 62

For example, when the user passes a control barrier like that shown in figure 1, the connection interface 6 will exchange the same information and will also load random information which may be listened to on the earpiece immediately or later when specifically requested.

Similarly, the handset can be used as an electronic wallet with contact free terminals enabling purchases or recharges.

The frequencies used for contact free transactions may be the same as the frequencies used for mobile telephony, for example 900 MHz or 1800 MHz, or they may be different if possible depending on the radio interface 60.

Obviously, the personal transaction device may be used in different forms (pager, speaking clock, computer, etc.) while remaining within the framework of the invention as claimed.